

REMARKS

Applicants respond herein to each issue raised by the Office Action. Applicants submit that the present rejections should be withdrawn for at least the reasons discussed below.

Claims 1-12 and 32-43 stand rejected under 35 U.S.C. § 103 as being unpatentable over United States Patent No. 6,570,233 to Matsumura et al. ("Matsumura"). Office Action, p. 2. Applicants note that independent Claims 1 and 32 have been amended above to incorporate recitations previously found in now canceled dependent Claims 9 and 40, respectively. Accordingly, the patentability of the independent claims will be addressed with reference to the rejections of Claims 9 and 40.

The rejections of Claims 1-12 and 32-43 fail to address the recitations of previously pending Claims 9 and 40, now incorporated in the independent claims, that the "concentration of dopants in the first poly film is lower than a concentration of dopants in the second poly film." However, the Office Action does assert that an "undoped lower poly film would have been obvious, because the subsequent P implant would provide for any needed conductivity. Office Action, p. 3. Applicants submit that such a modification to the Matsumura reference would be directly contrary to the objectives of Matsumura.

As described in Matsumura:

The characteristics of the semiconductor integrated circuit device 1 according to the present embodiment are the formation of a contact plug 72 of phosphorous (P) doped polysilicon made of a thin layer 60 which contacts with the substrate 10 and which is made of a material that includes a dopant of high concentration and a layer 70 made of a material that includes a dopant of a conventional concentration. Thereby, since the phosphorous concentration in the substrate interface rises, the direct contact resistance can be lowered.

Matsumura, Col. 3, lines 23-33 (emphasis added). Thus, the device of Matsamura expressly states that the lower thin layer 30 needs a higher phosphorous concentration than the layer 70 formed thereon, not a lower concentration in the lower layer as recited in independent Claims 1 and 32 of the present application. Accordingly, the rejections of independent Claims 1 and 32 should be withdrawn at least as the cited Matsumura reference expressly teaches away from the modification the Office Action asserts would be obvious.

The dependent claims are patentable at least based on the patentability of the independent claims from which they depend. Furthermore, various of the dependent claims are also separately patentable. For example, Claims 10 and 41 recite "forming the first poly film to a thickness selected to provide a desired depth of the region formed by ion implanting." The Office Action asserts that the "thickness of the lower poly film must be chosen to accommodate the P implant step." Office Action, p. 3. While this may be true, it does not render obvious the selection of a layer thickness to achieve a desired depth of implant region.

In fact, as described in Matsumura:

FIG. 6 shows the substrate 10, wherein a high concentration phosphorous (P) doped polysilicon layer 60 is, further, thinly deposited. The reason the high concentration phosphorous (P) doped silicon is deposited is that the direct contact resistance can be reduced because the phosphorous concentration in the interface part with the substrate 10 becomes higher. After this, phosphorous (P) ions are SAC injected with a high energy via the thinly deposited layer 60. This means that, under the condition where the thinly deposited layer 60 exists, ion injection is carried out via that layer 60. **Therefore, "thin" means to be thin to the extent that phosphorous ions of a high energy can sufficiently pass through the film. Because of ion injection of a high energy, the generated n⁻ region 55 reaches more deeply into the inside of the substrate 10 than does the n⁻ region 50 which has been formed through the first SAC injection.**

Matsumura, Col. 5, lines 13-28 (emphasis added). Thus, as described in Matsumura, the thickness of the deposited doped layer is selected to allow ion injection and the injection energy of the ion injection is used to establish the depth of the subsequently doped region. As such, Matsumura, if anything, teaches away from variations in thickness of the layer 60 to set a depth of the region 55. Accordingly, Claims 10 and 41 are also separately patentable for at least these reasons.

By way of further example, Claims 7 and 38 recited that the first poly film is "an undoped poly film." The Office Action asserts such would be obvious as the "subsequent P implant would provide for any needed conductivity." Office Action, p. 3. Regardless of whether the subsequent doping could do so, such an approach would clearly be contrary to the express disclosure of Matsumura. As an initial matter, Matsumura expressly requires a higher doping concentration for the lower layer as formed, not later doping of that layer to get a desired concentration. Furthermore, the injection energy of the later doping, for both

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Matsumura and the present application, is used to form an underlying layer of a desired depth. It is the understanding of the Applicants' undersigned representative that an injection energy selected for this purpose would not be suitable for providing doping of the layer 60 of Matsumura, nonetheless a high doping thereof. Thus, the subsequent doping of Matsumura would not appear to operate as alleged in the rejection. Accordingly, Claims 7 and 38 are also separately patentable for at least these additional reasons.

Newly added independent Claims 44 and 45 include recitations corresponding to those discussed above with reference to dependent Claims 10 and 41. Accordingly, Claims 44 and 45 are allowable at least for the reasons discussed above with reference to Claims 10 and 41.

Conclusion

Applicants respectfully submit that, for at least the reasons discussed above, the pending rejections should be withdrawn. Favorable reconsideration of this application is respectfully requested. If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (919) 854-1400.

Respectfully submitted,
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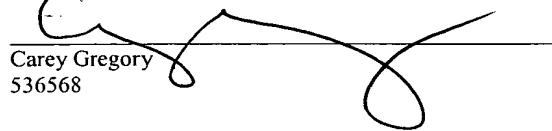
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